WHAT IS CLAIMED IS:

1. An apparatus, comprising:

a first diffusive material having a generally cylindrical shape with a length greater than twice its diameter;

a second diffusive material inside the first diffusive material separated from the first diffusive material by a cavity;

a transparent material proximate an inner surface of the second diffusive material operable to hold an absorptive material, the transparent material having an inner surface that is curved along its length in a substantially sinusoidal pattern;

first light detectors, comprising:

first optical fibers operable to carry light from the first diffusive material; and

first photodetectors operable to measure a first light intensity for the light carried from the first diffusive material;

second light detectors, comprising:

second optical fibers operable to carry light from the second diffusive material; and

second photodetectors operable to measure a second light intensity for the light carried from the second diffusive material;

first light sources operable to illuminate the cavity;

a second light source operable to illuminate the absorptive material with a collimated beam having an incident light intensity; and

a processor operable to:

determine an absorption coefficient for the absorptive material based on a first diffused light intensity measured by the first light detectors in the first diffusive material and a second diffused light intensity measured by the second light detectors in the second diffusive material, wherein the first and second diffused light intensities are measured while the cavity is illuminated by the first light sources; and

determine a scattering coefficient for the absorptive material based on a third diffused light intensity measured by the second light detectors in the second diffusive medium, wherein the third light intensity is measured while the absorptive material is illuminated by the collimated beam from the second light source.

2. A method for measuring an absorption coefficient, comprising:

introducing light into a cavity between a first diffusive material and a second diffusive material, wherein at least some of the light in the cavity passes into the first and second diffusive material and at least some of the light passing into the second diffusive material passes through a transparent material proximate to the second diffusive material and into an absorptive material;

measuring a first intensity comprising the intensity of the light in the first diffusive material;

measuring a second intensity comprising the intensity of the light in the second diffusive material; and

determining an absorption coefficient for the absorptive material based on the first and second intensity measurements.

3. The method of Claim 2, wherein the first and second diffusive materials are Spectralon cavities.

4. The method of Claim 2, wherein the first and second diffusive materials comprise concentric cylindrical shells; and the cavity comprises a cylindrical space between the first and second diffusive materials.

5. The method of Claim 2, wherein the transparent material comprises a quartz tube.

6. The method of Claim 2, wherein the transparent material comprises an inner surface that is curved along the length of the transparent material.

7. The method of Claim 6, wherein the curvation of the inner surface is substantially sinusoidal

8. The method of Claim 2, further comprising:

stopping the introduction of light into the cavity;

after stopping the introduction of light into the cavity, illuminating the absorptive material using a collimated beam, wherein scattered light from the absorptive material passes through the transparent material to the second diffusive material and light is not introduced into the cavity while the collimated beam is illuminating the absorptive material;

after illuminating the absorptive material with the collimated beam, measuring a new value of the second light intensity in the second diffusive material;

determining an incident light intensity for the collimated beam; and

determining a scattering coefficient of the absorptive material based on the incident light intensity and the new value of the second light intensity.

9. An apparatus, comprising:

a first diffusive material;

a second diffusive material inside the first diffusive material separated from the first diffusive material by a cavity;

a transparent material proximate to an inner surface of the second diffusive material operable to hold an absorptive material;

first light detectors operable to measure a first light intensity in the first diffusive material; and

second light detectors operable to measure a second light intensity in the second diffusive material, wherein an absorption coefficient for the absorptive material in the transparent material may be determined based on the first and second light intensities measured when the cavity is illuminated by a light source.

10. The apparatus of Claim 9, further comprising a processor operable to determine the absorption coefficient of the absorptive materials based on the first and second light intensities.

11. The apparatus of Claim 9, wherein the first and second diffusive materials are Spectralon cavities.

12. The apparatus of Claim 9, first and second diffusive materials comprise concentric cylindrical shells; and the cavity comprises a cylindrical space between the first and second diffusive materials.

13. The apparatus of Claim 9, wherein the transparent material comprises a quartz tube.

14. The apparatus of Claim 9, wherein the transparent material comprises an inner surface that is curved.

15. The apparatus of Claim 14, wherein the curvation of the inner surface is substantially sinusoidal.

16. The apparatus of Claim 9, further comprising an additional light source operable to illuminate the absorptive material with a collimated beam having an incident light intensity, wherein a scattering coefficient may be determined based on the second light intensity then the absorptive material is illuminated by the collimated beam and the incident light intensity.

17. A method for measuring a scattering coefficient, comprising:

illuminating an absorptive material with a collimated beam having an incident light intensity, wherein the absorptive material is within a transparent material substantially surrounded by a diffusive material;

measuring a diffused light intensity in the diffusive material; and

determining a scattering coefficient for the absorptive material based on diffused light intensity and the incident light intensity.

18. The method of Claim 17, wherein the diffusive material is a Spectralon cavity.

19. The method of Claim 17, wherein the diffusive material comprises a cylindrical shell.

20. The method of Claim 17, wherein the transparent material comprises a quartz tube.

21. The method of Claim 17, wherein the diffusive material is enclosed by a reflective material having a reflective inner surface.

22. The method of Claim 17, wherein the diffusive material is a first diffusive material, and the first diffusive material is substantially surrounded by a second diffusive material separated from the first diffusive material by a cavity.

23. The method of Claim 22, further comprising:

illuminating the cavity;

measuring a first diffused light intensity in the first diffusive material;

measuring a second diffused light intensity in the second diffusive material; and

determining an absorption coefficient for the absorptive material based on the first and second diffused light intensities.

24. An apparatus, comprising:

a transparent material operable to hold an absorptive material;

a diffusive material substantially surrounding the transparent material;

light detectors operable to detect a diffused light intensity in the diffusive material;

a light source operable to illuminate an absorptive material with a collimated beam having an incident light intensity, wherein a scattering coefficient for the absorptive material may be determined based on the incident light intensity and the diffused light intensity.

25. The apparatus of Claim 24, further comprising a processor operable to determine the scattering coefficient for the absorptive material based on the incident light intensity and the diffused light intensity.

26. The apparatus of Claim 24, wherein the diffusive material is a Spectralon cavity.

27. The apparatus of Claim 24, wherein the diffusive material comprises a cylindrical shell.

28. The apparatus of Claim 24, wherein the transparent material comprises a quartz tube.

29. The apparatus of Claim 24, wherein the diffusive material is enclosed by a reflective material having a reflective inner surface.

30. The apparatus of Claim 24, wherein the diffusive material is a first diffusive material, and the first diffusive material is substantially surrounded by a second diffusive material separated from the first diffusive material by a cavity.

31. The apparatus of Claim 30, wherein:

the light source is a first light source, the light detectors are first light detectors, and the diffused light intensity is a first diffused light intensity;

the apparatus further comprises:

a second light source operable to illuminate the cavity;

second light detectors operable to measure a second diffused light intensity in the second diffusive material; and

an absorption coefficient for the absorptive material may be determined based on the first and second diffused light intensities when the cavity is illuminated.